Restoring Balance by Diversion in the World Coffee Market

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1. Background and Context

Over the eleven year post-intervention period October 1989 to September 2000, the ICO indicator price averaged 93c/lb. In real terms, the average price was 103c/lb at 2000 prices.[1] Excluding the 18 month period April 1994 through September 1995, during which prices were distorted by the effects of the Brazilian frost and the subsequent speculative fever, the average nominal price was 84c/lb, equivalent to an average real price (at 2000 values) of 93c/lb. The March 2001 ICO indicator price of 48.5c/lb was are only slightly above half this level.

At the same time and despite low prices, there is growing disquiet on the part of the coffee processing industry in relation to the quality of coffee available on world markets. These worries are variously attributed to the effects of market liberalization, increased competition and on pressures to bulk coffee for transportation.[2] The coffee diversion proposal is aimed at both problems.

2. Nature of the Price Problem

We consider three possible explanations for the current low level of coffee prices:

a) The market is over-supplied and is expected to remain over-supplied. We discuss this below.

b) The high value of the dollar relative to many producing country currencies implies that dollar values over-estimate the price decline. Our estimate is that currency depreciation among coffee-producing countries (most notably Brazil, Indonesia, Thailand and Uganda) is responsible for a significant proportion of the decline in the dollar price. If current dollar exchange rates had prevailed during the entire post-intervention period, we believe that the average real price would have been only 78c/lb.[3] On that basis, the March 2001 price was 62.5% of our estimated long term sustainable level.

c) Productivity growth has lowered the prices producers can expect. Productivity in most commodities is growing at around 1%-2% per annum. We assume a 1½% rate of productivity advance in coffee over the 1990s, although this cannot be estimated accurately. The implication is that, with the same production and stock levels, prices would be 16½% lower in 2000 relative to 1990.

3. Coffee Prices in the Post Intervention Coffee Market

Agricultural economists often link prices to availability, defined as current production plus carryover from previous years. This approach may be rationalized if production

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[1] We have deflated by the US wholesale price index for industrial goods. Other choices of deflator give similar but not identical results.

[2] These explanations of the perceived decline in coffee quality have been disputed.

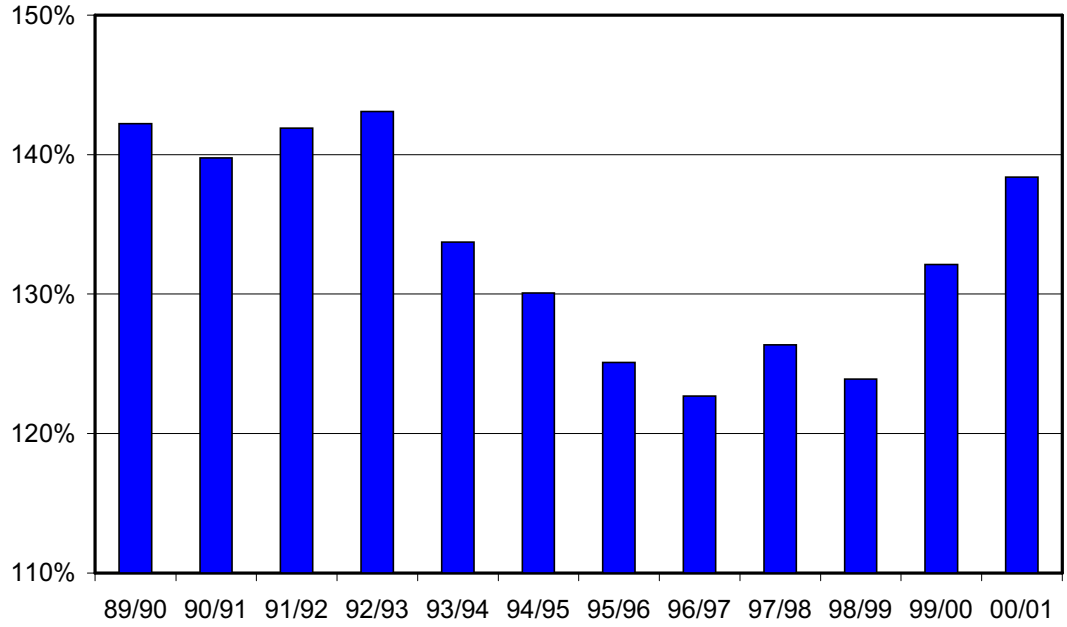
[3] We have constructed an index of the dollar exchange rates (source: IMF, *International Financial Statistics*, March 2001) of all ICO producing members with 1999-2000 production in excess of 1,000,000 bags. The index was weighted by 1999-2000 production (source: ICO, *Coffee Statistics*, June 2000). We suppose that a 1% increase in this index results in a 1% decline in the dollar coffee price - this is consistent with the data. We experimented with a similar index for ICO coffee importing countries, but this did not aid in explaining coffee price movements.

exhibits very little responsiveness to prices in the short term, with the implication that the market is balanced by changes in stocks and consumption. This approach appears to work well in the coffee industry with the following two modifications:

i) We replace production by an average of production in the current crop year, the preceding year, and expected production in the following year. Expected production is seen as constant over the period 1989-90 to 1995-96, but as rising at slightly over 2½% per annum thereafter.

ii) We give producer stocks a weight of one half in constructing the availability measure. This can be justified on the argument that producers are not always prepared to make stocks available for export. However, consumer stocks (which are evidently available for consumption) enter with the same weight as production.[4]

Figure 1: Coffee Availability - 1989-90 to 2000-01

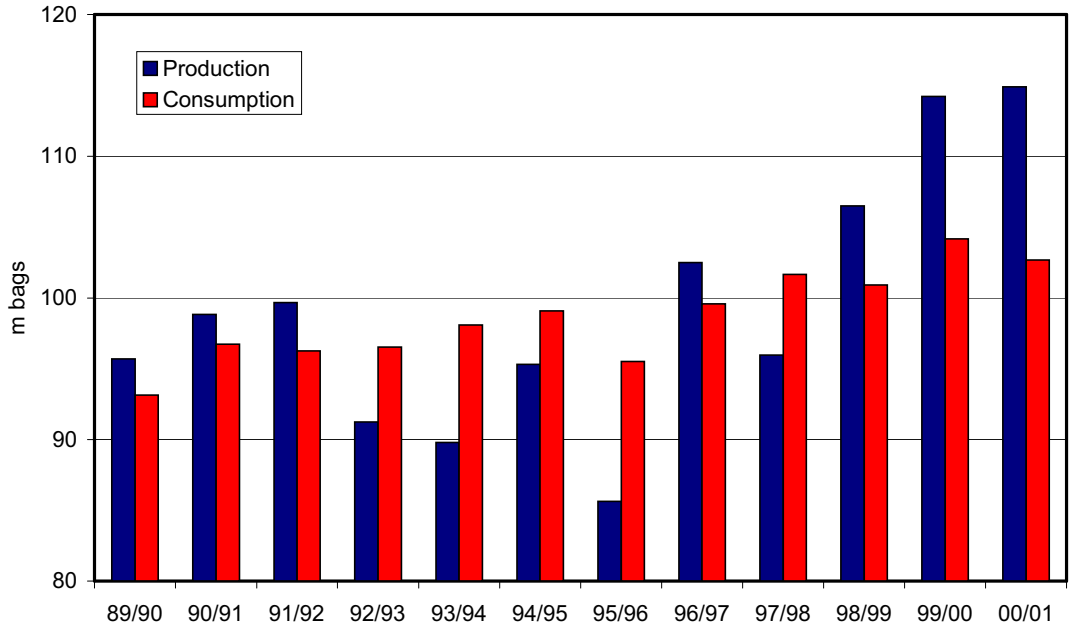


The resulting availability series is graphed in Figure 1. It shows high levels of availability in the initial four post-control years (1989-90 to 1992-93), thereafter declining to much lower levels to reach a minimum in 1996-97, followed by reversion to the levels of the early 1990s in 1999-2000 and 2000-01.

The increase in availability over the past three crop years is due to a surge in production against the background of only modest increases in consumption – see Figure 2. The increase in production is now becoming reflected in an increase in stocks, particularly stocks held in consumer countries, but this is an effect and not the cause of the current imbalance. However, so long as consumer stock levels remain high, the current excess of production over consumption will continue to weigh on the coffee price.

[4] Producer stocks are end-crop year stocks in ICO producing member countries. Consumer stocks are June stocks of green coffee in ICO consuming member countries.

Figure 2: Total ICO Production and Consumption



This availability measure provides a reasonable explanation for prices except in the frost year 1994-95 – see Figure 3. The Figure relates the average real price in the designated crop year, corrected for exchange rate changes and productivity growth, to production averaged across that year, the preceding year and an estimate for the following year, together with the stock level at the start of the crop year.

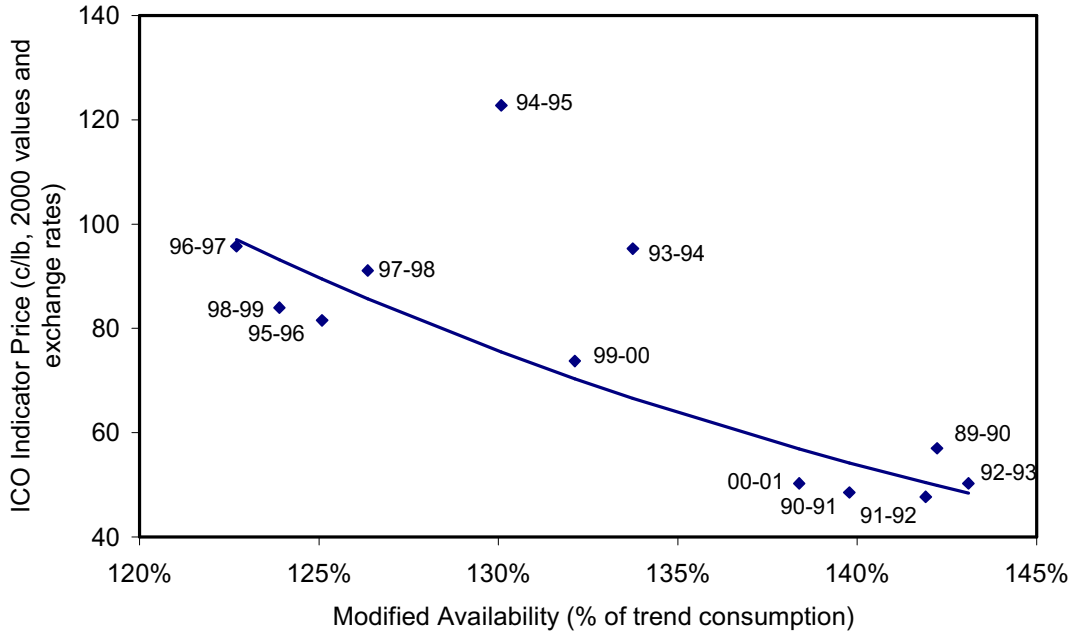
Figure 3 shows three groups of points.

a) Four years in which availability was low and the coffee price was correspondingly high (1995-96, 1996-97, 1997-98 and 1998-99).
b) Three years of moderate availability (1993-94, 1994-95 and 1999-2000) in two of which (1993-94 and 1994-95) the price was distorted upward by the effects of the severe Brazilian frosts of in June-July 1994.
c) Five years in which availability was high and price was low (1989-90, 1990-91, 1991-92, 1992-93 and 2000-01).

The figure suggests that the current market situation is broadly comparable with that in the early 1990s when coffee prices were depressed by the stock overhang available to the market as the consequence of the ending of ICA export controls. Although current prices appear lower than those prevailing a decade ago, this is in part the impact of the high dollar, and in part the consequence of cumulated productivity advance.

The model which Figure 3 is based was estimated over the eleven year period 1989-90 – 1999-2000. We calculate a (provisional) modified availability figure of 138.4% for 2000-01. On this basis, the model predicts a price of 56c/lb for the 2000-01 crop year. This is approximately 7c/lb higher than the average for first six months of the year (the point illustrated in Figure 1). The discrepancy might arise either from an under-estimate of the physical position, or from the impact of "fund" speculation.

Figure 3: Exchange Rate-Adjusted Deflated Price versus Availability



4. Coffee Diversion: How Much is Required to Restore Balance?

Coffee diversion has two objectives: restoration of market balance and improvement of coffee quality. Market balance requires that both production and stock levels are in line with coffee consumption. It is now generally seen as preferable to aim for balance through intermediate quantity objectives rather than price objectives – judgments on market balance made in quantity rather than price terms are both simpler and less likely to become politicized. An appropriate quantity objective would be to reduce stocks to normal levels and to balance export availability with consumption.

The model illustrated in Figure 3 implies an approximate 2c/lb increase in the ICO Indicator Price for every one million bags of coffee removed from the market. Over this eleven year period, the availability measure developed in section 2 averaged 133.3%. We may take this as providing an estimate of "normal" market conditions. At current exchange rates and productivity levels, this level of availability is consistent with a price of 69c/lb.

Table 1 gives our estimates of the quantity of diversion required to restore market balance in the sense defined above. We assume trend growth in consumption but maintain production constant at its 2000-01 level. The implied required quantity to be diverted is estimated at 10½ million bags in 2001-02, falling to an average of 4.8 million bags in the following years.

The impact of diversion is calculated as a north-westerly move along the line in Figure 3. In general, observations are above or below the line. In principle, diversion may be accompanied by a move closer to or away from the line. In the current situation, in which the 2000-01 price appears well below the theoretical line, the impact of diversion, measured by the slope of the line, might be somewhat larger than 2c/lb per million bags diverted if it also reverses bear "fund" speculation. This

indicates that an initial diversion level of somewhat less than the 10½ million bags implied by Table 1 might be sufficient for 2001-02.

Table 1
Restoration of Coffee Market Balance by Diversion

Millions of bags (60 Kg.), October to September

	1999-2000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
Opening stocks in coffee-producing countries	23.5	22.3	25.2	25.2	25.2	25.2	25.2
Total production	114.9	111.3	111.3	111.3	111.3	111.3	111.3
Total availability	138.4	133.5	136.5	136.5	136.5	136.5	136.5
Consumption of coffee-producing countries	24.6	26.0	26.3	26.5	26.7	26.9	27.1
Consumption of non-coffee producing countries	79.0	77.1	77.8	78.4	79.1	79.7	80.4
Total consumption	103.6	103.2	104.1	104.9	105.8	106.7	107.5
Closing stocks in coffee producing countries	25.2	25.2	25.2	25.2	25.2	25.2	25.2
Quantity to be diverted			10.6	6.1	5.2	4.3	3.4

The concept of *price flexibility* helps understand the circumstances in which diversion will be effective in raising the coffee price. The price flexibility of a market measures the price impact of a 1% reduction in availability. If the price flexibility exceeds unity, a 1% reduction in availability increases the price buy more than 1%. It therefore increases aggregate revenues by more than the cost of diversion. The flexibility underlying Figure 3 is (almost exactly) two, so this condition is satisfied. However, the price flexibility of a market is simply the inverse of the sum of the demand and supply price elasticities. Since elasticities tend to be higher in the long term than the short term, the market price flexibility will be lower in the long term than the short term. This is because, over time, at least part of the diverted supply will be offset by increased production, at least relative to the no diversion situation. The implication is that a sustained diversion programme will have a smaller price impact than a once-for-all diversion policy. This suggests that diversion may need to exceed 5 million bags in later years to achieve the required objective.

This has implications for the objectives of the diversion policy. The problem facing the coffee market in the early 1990s was a stock overhang as the consequence of producer stocks, retained under the ICA export control regime, becoming available to the market. Although production was running slightly ahead of consumption – see Figure 2 – a once-for-all diversion programme would have substantially relieved the market imbalance. Currently, the market imbalance originates in the substantial excess of production over consumption rather than in an accumulated stock overhang. Diversion is likely to be less effective in dealing with this situation – it effectively validates excess production by raising prices to ensure profitability, but in so doing, it fails to address the fundamental problem of excess production.

The same conclusion applies to retention. Furthermore, in the absence of a continuing control regime, retained stocks continue to be available to the market if

demand is sufficiently high. We should therefore expect the impact of diversion of as given quantity of coffee to be greater than that following retention of the same quantity.[5] The most appropriate policy for dealing with an imbalance of production over consumption is for countries to provide incentives for reduction of the area under coffee cultivation. The overall conclusion is that diversion of coffee to alternative uses can be an effective means of raising prices, but it does not address the problem of long term market imbalance. Coffee diversion should therefore be seen as a means of augmenting a long term supply management strategy rather than as a substitute for such a policy.

Perceptions as to whether or not the diversion policy is sustainable might influence the market outcome. In practice, this implies that if schemes to restrict supply are well supported by participants in the market, the actual increase in prices will occur in advance of implementation. A survey of ICO members there suggests that there is support for such policies.

5. How Might Coffee Diversion be Organized?

Retention and diversion share the objective of removing coffee from the world market thereby raising prices. Diversion has an advantage over retention that it can also result in an improvement in coffee quality. The two policies also face similar enforcement and monitoring problems[6]. Diversion to alternative uses has the advantage over retention that the quantities involved are permanently removed from the market. Retention will only lift prices to the extent that retained stocks are regarded as unavailable the two schemes will have quite different effects on consumer stockholding – retention will result in consumers reducing stocks, since coffee will be available from producers, while diversion should increase consumer stockholding because of the increased potential for subsequent excess demand and / or price rises. Diversion and retention have the potential to complement and reinforce one another since diversion of retained stock will increase the price impact of producer stocks.

Diversion may be organized in either of two ways:

i) ICO producing member governments can bear the responsibility of diverting a specified tonnage of their own production (or stock).
ii) ICO member governments (perhaps consumer as well as producer governments) could contribute financially to provide funds for purchase of coffee for diversion.

The first approach avoids direct budgetary costs but typically imposes costs on farmers. A simple scheme would be for each country to be responsible for diverting 10% of its production. However, the scheme would face the same monitoring problems as the ACPC retention scheme –in particular, countries which lack suitable mechanisms and institutions and for this or other reasons might free ride on those who do divert. Monitoring is much easier if firms contribute financially to a diversion scheme – it is clear who has and who has not contributed.

The second approach has a number of advantages:

[5] Our model implies that diversion is twice as effective as retention. However, this estimate is necessarily somewhat conjectural.

[6] The ACPC coffee retention plan contains a large section on controls, involving inspection, ratification, verification etc. of agreed retention, and a section on sanctions if countries fail to comply with the rules.

- To the extent that diverted stock was purchased on one or other of the coffee terminal markets, it would have immediate and direct market impact. However, the budgetary cost of the scheme would fall directly on governments. By contrast, if governments retain responsibility for diversion, they have the potential to push the cost of intervention back onto farmers – for example, by obliging exporters to divert specified tonnages of coffee to designated uses at their own cost. But in either case, free riding will be a potential problem – either because government will fail to implement agreed diversion procedures, or because they will fail to make agreed financial contributions.
- The other major objective of coffee diversion is that of raising the average quality of the coffee on the world market. There are a number of technical measures of coffee quality, in particular relating to defect content. of coffee is ideally identified technically for example by measuring its defect content. It is widely considered that the market specifies minimum quality standards. Diversion is one means by which these quality objectives might be attained. A complicating factor is that different producing countries have different proportions of poor quality coffee, depending on their marketing systems, the types of coffee they produce and their existing quality controls. This lack of balance argues in favour of a contribution-based diversion system rather than a system in which each country maintains responsibility for diversion of its own production since the former method could be more efficiently adapted to the uneven distribution of lower quality coffee.

There is no clear superiority of either approach, and ICO member governments will need to carefully weigh the various considerations.

6. Cost-Benefit Analysis

We estimate that diversion of coffee will be profitable. The calculations are shown in Table 2 assuming diversion levels of respectively 1 million, 5 million,10 million and 20 million bags. Revenue benefits are in terms of ICO export revenues rather than total sales revenues since any increase in revenues from sale to domestic consumers is simply a transfer within the producing countries. The calculations suppose that diverted coffee has zero value.

Table 2
Estimated Costs and Benefits of Diversion

Quantity diverted (m bags)	1	5	10	20
Post-diversion price (c/lb)	53	61	71	91
Diversion cost ($m)	70	401	935	2399
Increase in 2001-02 Export Revenue ($m)	214	1071	2143	4286
Increase in Discounted Future Revenues ($m)	204	1018	2036	4071
Profit from Diversion ($m)	348	1688	3243	5958
Profit per lb diverted ($/lb)	2.63	2.55	2.45	2.25

If we ignore monitoring costs and compliance costs, the costs of diversion are borne entirely at the time the diverted coffee is purchased. Benefits extend over time through the impact of lower stock levels . Table 2 gives estimates both of the immediate additional revenue from diversion, and the discounted value of the

additional revenue over the succeeding four crop years.[7] The calculations show that diversion is clearly and substantially profitable.

It should be emphasized that these calculations are subject to a wide margin of error, both because there are currently only eleven years of usable data on price determination in an uncontrolled coffee market and because diversion is an untried policy, which makes its effects difficult to estimate. In particular, the figures in Table 2 may underestimate the benefits of diversion for a number of reasons:

a) It is likely that coffee taken off the market will have positive value in other uses. We have not attempted to estimate this value. It is important to be aware of the incentives for purchase of diverted coffee for resale in the world market - any such sales will offset the value obtained from diverting coffee to alternate uses.
b) To the extent that lower quality coffee is diverted to alternative uses, the average quality of coffee available for consumption will rise. This should imply a higher attained price and also a higher level of consumer satisfaction.
c) As noted above, by changing the current bearish market sentiment, a diversion programme may lift prices by more than the 2c/lb per million bags implied by our model.

There are other factors which go in the opposite direction. Nevertheless, we are confident that if properly executed, a diversion programme would both generate positive revenues to coffee-producing countries and raise the quality of coffee on world markets.

7. Summary and Conclusions

Diversion of coffee to alternative uses can be an effective means of raising prices. We estimate that every million bags diverted raises coffee prices by around 2c/lb. If monitoring and compliance costs are ignored, this figure implies that the revenue benefits from diversion substantially exceed diversion costs. However, the major problem currently facing the coffee market is a continuing excess of production over consumption. An imbalance of this sort is not addressed by a diversion policy alone. If diversion is to be effective, there must be a continuing programme, but in that case, it is likely that, over time, diversion will discourage reductions in capacity and thereby reduce the effectiveness of the programme. Coffee diversion should therefore be seen as a means of augmenting a long term supply management strategy rather than as a substitute for such a policy.

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[7] We discount at 10% per annum.